

Overview

The Wastewater Treatment Plant Monitoring Program was performed in accordance with Permit PE #115. Monthly and weekly laboratory results were sent to the Ministry of Environment, as well as used for this yearly report. Additional monitoring and testing of the Wastewater Treatment Plant was carried out for operational and maintenance purposes.

Introduction

The City of Merritt's Wastewater Treatment Plant (WWTP) is located at 1298 Coldwater Avenue in the City of Merritt Public Works Yard. The City of Merritt's WWTP only treats Wastewater from the City of Merritt. No other influent is accepted into the system unless authorized by the Public Works Manager. Merritt's WWTP was officially opened in August 1963 with a discharge permit of 1364 cubic meters per day. Since that time, the plant has undergone two major upgrades and many smaller upgrades. The first major upgrade was in May 1985 which consisted of a new building and dewatering equipment. The second upgrade in 2007-2008 which consisted of a building with a grit removal system, a second story was added to the existing motor control room (MCC) and new motor control equipment. Other upgrades to note are the addition of two rectangular clarifiers in 1992 that replaced the old smaller ones, rapid infiltration basins were added in 1988 for final effluent disposal, stopping the year-round discharge into the Coldwater River. A belt filter press installed in 1996 that now allows us to send our bio-solids for composting. The Bio-solids composting was started in 2008. The City of Merritt has strived to keep the WWTP operating with modern control systems and equipment that keeps its discharge levels well below the permitted levels set out by the Ministry of Environment. Also, with the newer equipment, we can run motors and pumps more efficiently which in turn is a large energy and cost savings to the City.

Collection System

The gravity Sanitary Sewer System is maintained by the Public Works Utilities Department. The Wastewater Treatment Division looks after two (2) Syphons and two (2) Lift Stations. Due to changes in regulation, the Wastewater Collection System was required to be classified in 2013. The City of Merritt's Wastewater Collection System is now regulated and classified as a Level II system. This system is maintained and monitored by Certified Operators.

Nicola Lift Station is a small station with a 2.4 horsepower Flygt pump. In 2020, up from 2019, the Nicola pump, ran an average of 86.6 minutes a day and up to a maximum of 886 minutes on June 1, 2020. The station is monitored by the WWTP's SCADA system 24/7 and will alarm the on-call operator if there is a high level in the station. A backup pump is stored at the WWTP for the Nicola Lift Station in case of a pump failure. In 2020 there were no failures or major repairs at the Nicola Lift Station.

Collettsville Lift Station is a larger station that takes the wastewater flow from all the Collettsville area. The station is made up of 2, 10 horsepower Flygt pumps, a flow meter, a Programmable Logic Controller (PLC), wireless communications and a diesel-powered backup generator for power outages. In 2020 Collettsville ran an average of 71 minutes a day and up to a maximum of 211.2 minutes, on June 1, 2020. Collettsville is monitored and will send out alarms 24/7 for high level, loss of communication, loss of power and pump failure by the WWTP's SCADA system. Each year, both pump stations are cleaned with a vacuum truck and the pumps pulled for inspection and/or repairs.

Lift Station Maintenance and Capital Projects completed in 2020 include:

- Nicola lift station was cleaned four times by the City's own Vactor truck.
- Nicola lift station pump was removed and inspected four times throughout 2020.
- Replaced Flush valve at Nicola lift station.
- Collettsville lift station's pumps were pulled and inspected in August 2020.
- Replaced Collettsville Pump 2 May 26, 2020
- Had a Pump rebuilt to have a working spare.
- Collettsville lift station was cleaned four times by the City's own Vactor truck.
- Physically inspected each lift station every week for operation and vandalism.

Lift Station Goals & Objectives planned for 2021 include:

- Weekly inspection of pumps and level bulbs.
- Clean both force mains and inspect.
- Annual pump inspection.

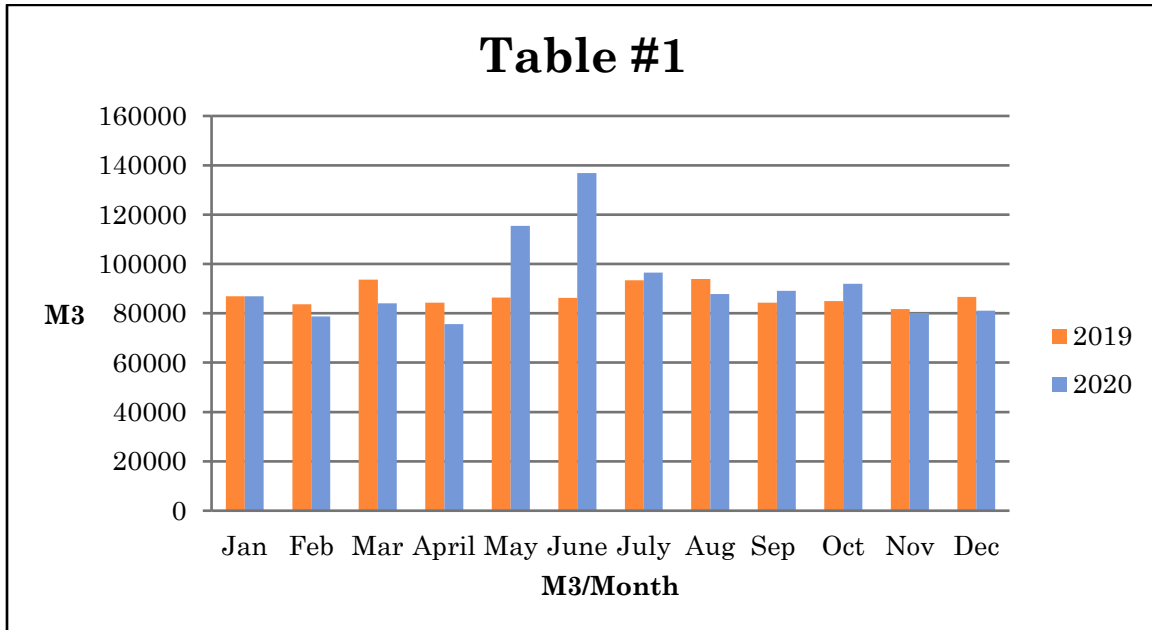
Influent (Raw Wastewater)

In 2020 the City of Merritt Wastewater Treatment Plant received 1,104,337 m³ of influent from the sanitary sewer system. The 2020 average daily influent flow rate was 3017 m³/day. The average influent flow rate per person was 392 liters/day/person based on a population of 7722 for the city of Merritt, this is a 4% decrease from the 2020 influent flow average.

Peak flow day was observed on June 1 at 5964 m³.

Minimum flow day was observed on May 6 at 2221 m³.

Table #1 shows the monthly flow comparison from 2019 to 2020.



Wastewater Treatment Plant

The City of Merritt operates a Class IV Conventional Activated Sludge Wastewater Treatment Plant. The WWTP is a 24/7 operation with the operators working 8 hours a day five days a week. A few hours a day are worked on weekends for process testing and operational checks. The Wastewater Treatment Plant is operated and maintained by Certified Operators.



Wastewater Treatment Plant

The Wastewater Treatment Plant treats the wastewater influent received from the City by creating an environment in the basins ideal for micro-organisms to grow and break down organic solids. The influent is directed through a series of different equipment and tanks to produce a high-quality effluent that is then directed to Rapid Infiltration (RI) Basins. Also, from this process thickened sludge is stored and run through a belt filter press to create a substance called bio-solids. These bio-solids are hauled to the City of Merritt Composting Facility to be converted into a useable product that is used as a soil supplement.

In 2020 the WWTP removed a total of 92% Biological Oxygen Demand (BOD5), 94% of the Total Suspended Solids, 98% Total Dissolved Phosphorous and 95% Total Phosphorus from the Influent.



Motor Control Centre

The WWTP uses a *Supervisory Control and Data Acquisition (SCADA)* and *Programmable Logic Controllers (PLC)* to help control and operate many different parameters within the WWTP. These controllers control equipment at rates that are exactly as required. This results in a large power savings for the City of Merritt. In 2008 the latest WWTP upgrades were officially completed. The new lift station that replaced the aging screw pumps and the new degrit building are proving to produce a quality effluent. The new motor controls are also proving to be more efficient and have been considerably more reliable than the older equipment that was

replaced.

Summary of WWTP/Lift Station emergency call outs for 2020:

- WWTP – 6
- Lift Stations – 2
- Flood related -7

In 2020 there was decrease of callouts related to the plant by 54%. The call outs related to Lift Stations decreased by 80%.

Wastewater Treatment Plant Maintenance and Capital Projects completed in 2020 include:

- Replaced Moyno Polymer pump.
- Bearing replacement on the Belt Filter Press.
- New Conveyor for Bio solids loading.
- New Clarifier troughs and weirs.
- New blower pipes in Aeration tanks.
- New Aeration troughs.
- Cleaned and Inspected Aeration tanks.
- Replaced RAS line Y.
- Replaced Flex joints on all blowers.
- Installed a RAS flowmeter.
- Replaced WAS flowmeter.
- Cleaned, disinfected and painted Press room.
- Serviced Grit Classifier.
- Replaced Grit Pump

- Cleaned and inspected Cl2 contact Basins.
- New Electrical panel in Dechlorination shed.
- New lighting in load bay.
- Clean, inspect Grit chamber and Equalization tank.
- Cleaned Main lift station 4 times.

WWTP Goals & Objectives planned for 2021 include:

- Daily/Weekly inspection and cleaning of equipment.
- Develop Master Plan for the WWTP.
- Replace SCADA computer.
- Repair leaking Blower pipes.
- Replace DO probes.
- Clean and inspect Digester.
- Continue to train and promote operator education.
- Continue to explore ways that conserve water and power usage.

Quality Monitoring

As outlined in our discharge permit, the City monitors daily influent flow and weekly phosphorus levels. Also, as part of the operating permit, monthly samples are taken for a 5-day biological oxygen demand (BOD5), Total Suspended Solids (TSS), total phosphorus (TP) and total dissolved phosphorus (TDP).

Table #2 shows the parameters monitored for our permit and the WWTP's 2020 average monthly lab results. You will notice we have maintained a yearly average of over 55.5% lower BOD5, 68.9% lower TSS, 62% lower TP and 88% lower for TDP then the maximum allowable permit levels.

Table #2

Parameter's for RI Basin Inflow	PE #115 Requirements	2020 WWTP Average
Daily Flow	4615 m ³	3017 m ³
BOD5	< 45 mg/l	20 mg/l
TSS	< 45 mg/l	14 mg/l
TDP	< 1.0 mg/l	0.12 mg/l
TP	<1.0 mg/l	0.38 mg/l

Table #3 shows the requirements of our permit if effluent is directed to the Coldwater River. In 2020 final effluent was directed to the Coldwater River from May 30 – June 7. Final effluent had not been directed to the Coldwater River since 2018.

Table #3

Parameter's for River Discharge	PE #115 Requirements	2020 WWTP Average
Daily Flow	4615 m ³	2543 m ³
BOD5	< 30 mg/l	10.8 mg/L
TSS	< 40 mg/l	19.6 mg/L
TDP	< 1.0 mg/l	.07 mg/L
Chlorine Residual	Non-detectable	Non-detectable

Table #4 shows the average monthly lab results for influent, effluent, phosphorus levels and total suspended solids. These results are sent to the Ministry of Environment monthly.

Table #4

2020	Final Effluent				R.I Basin #2		Raw Wastewater			
	B O D	TSS	TDP	TP	TDP	TP	BOD	TSS	TDP	TP
Month	mg/l	mg/l	plant	plant	basin	basin	mg/l	mg/l	plant	plant
Jan	12.3	11.6	0.06	0.25	0.07	0.19	252	302	6.00	7.9
Feb	18.4	8	0.17	0.25	0.11	0.22	250	350	5.66	8.4
Mar	33.2	22.7	0.13	0.54	0.12	0.38	330	254	6.16	8.9
Apr	10.8	11.8	0.10	0.34	0.02	0.11	196	250	6.17	9.9
May	31.2	19.6	0.07	0.45	0.10	0.25	236	184	4.09	6.6
Jun	10.8	12.8	0.06	0.21	0.01	0.28	171	198	3.71	5.8
Jul	11.7	8	0.13	0.27	0.10	0.28	205	222	5.23	7.7
Aug	35.5	17	0.19	0.57	0.27	0.44	279	220	5.64	7.5
Sep	28.1	14.8	0.20	0.58	0.26	0.44	257	233	6.53	8.1
Oct	12.9	12	0.16	0.40	0.17	0.29	230	185	5.53	7.9
Nov	22	13.6	0.08	0.35	0.09	0.22	262	238	6.42	8.4
Dec	17.2	11.2	0.08	0.30	0.10	0.22	253	260	5.46	7.9
Av.	20	14	0.12	0.38	0.12	0.28	243	241	5.55	7.9
Max	35.5	22.7	0.20	0.58	0.27	0.44	330	350	6.53	9.9
Min	10.8	8	0.06	0.21	0.01	0.11	171	184	3.71	5.8

Wastewater treatment plant operators also test, sample, monitor, and record 40+ other parameters each day to keep the plant operating at a high level of efficiency. Table #5 & #6 show some of these parameters that are monitored.

Table #5

2020	Waste	Rate	Digester	Press	Feed	Solids	Cake	D.M.T.	Capture
Month	m3/day	%	%	hours	m3	m3	%	tons	%
Jan	40.3	1.6	0.89	83.8	2495	260	12.6	33.3	96.9
Feb	35.2	1.4	0.92	76.2	2238	150	11.5	17.3	96.8
Mar	42.2	1.7	0.83	68	2013	165	11.9	19.6	98.7
Apr	44	2	1.03	68.7	1954	150	12.9	19.6	97.5
May	67.2	2.2	0.86	79.8	2423	172.5	13.6	23.3	98.4
June	71.1	1.7	1.03	58.6	1731	150	13.1	19.7	97.5
July	73.4	2.6	0.45	89	2624	142.5	13.5	19.1	98.2
Aug	68.5	2.7	0.8	67.7	1985	172.5	12.3	21.3	97.6
Sept	75	2.8	0.81	78.2	2288	187.5	13.4	25.4	96.8
Oct	65.9	2.4	0.84	68.1	2020	180	12.1	21.8	98.1
Nov	68.3	2.8	0.95	64.6	1904	142.5	13.4	19.0	97.5
Dec	66.9	2.9	0.94	80.8	2387	240	12.7	28.9	98.4
Avg.	60	2	1	74	2172	176	13	22	98

Table #6

2020	Flows	Raw SS	MLSS	MLVSS	RAS	SVI	Settling
Month	m3/day	mg/L	mg/L	mg/L	mg/L	ml/L	%
Jan	2802	257	2855	2066	10217	153.4	44
Feb	2714	263	3364	2398	9905	181.2	61
Mar	2713	286	3316	2327	10322	165.4	55
Apr	2519	261	3611	2554	12091	109.3	39
May	3726	189	3362	2320	10661	101.4	34
June	4563	156	3582	2431	11890	83.1	30
July	3112	185	3305	2332	8913	119.5	39
Aug	2833	190	3189	2267	10016	99.2	32
Sept	2971	249	3188	2249	9482	76.8	24
Oct	2968	243	2928	2077	8613	91	27
Nov	2673	287	3200	2212	9980	77.7	25
Dec	2615	221	3343	2367	10070	90.2	30
Avg.	3017	232	3270	2300	10180	112	37

Rapid Infiltration Basins (RI)

The RI basins are located 0.7km west of the WWTP across the Coldwater River. The basins are a very simple system that receives the final effluent which is gravity fed from the WWTP then piped under the Coldwater River to a lined containment basin. The containment basin always remains full, from this basin the overflow is directed to feed the rapid infiltration basins. When the flow is directed to one of three rapid infiltration basins it allows the final effluent to seep naturally back into the ground. Each of the three rapid infiltration basins is rotated on a two-week cycle.



Rapid Infiltration Maintenance and Capital Projects completed in 2020 include:

- Disked each basin.
- Weeded around each basin.
- Rebuilt the main road.

Rapid Infiltration Basin Goals & Objectives planned for 2021 include:

- Weekly inspection and cleaning of valves and pipes.
- Disk each basin.

Bio-Solids Dewatering

Solids that are settled out of the wastewater treatment process from the clarifiers are stored in an aerated digester. The solids are then pumped to a belt filter press. The belt filter press separates the water from the solids. In 2020 the solids were pumped to the press at an average concentration of 1.0% solids with the rest being 99% water. The 1.0% is then pressed to an average of 13% cake solids and the separated water is returned to the influent of the plant. The Bio-solids are then trucked to the composting site near the airport. In 2020, we averaged taking 4 dump truckloads or 30 m³ a week to the composting site. As shown in table #5 the press operated 883.5 hours and pressed 26,062 m³ of digested solids in 2020.



Belt Filter Press

Belt Filter Press Goals & Objectives planned for 2021 include:

- Daily/weekly inspection and cleaning of equipment.
- Replace filter belt on press.
- Replace side seals.
- Replacement of bearings.

Bio-Solids



City of Merritt Composting Site

In November of 2015, the City of Merritt purchased the composting operation from the Good Earth Company.

The composting is now performed by City Staff on City owned property. The site has been developed to use the method of aerated static piles. With this method of composting the City of Merritt Composting Facility has successfully created a composted material that can be reused as a soil supplement. The City of Merritt has used this compost in many different applications around the City.